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Optical Multiple Access Network (OMAN) for Advanced Processing Satellite Applications

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by

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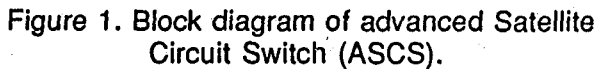
SUMMARY

Advanced Processing Satellites require a circuit switch which interconnects N uplink RF receivers with N downlink RF transmitters at a data rate D (see Figure 1). Optical multiple access networks based on code division multiple access (CDMA) are viable candidates for this switching function because they are compatible with bursty, asynchronous, concurrent communication [1,2,3] and minimize scheduling delays [4]. We have designed such a circuit switch based on temporal/spatial CDMA. The encoders and decoders are (0,1) pseudo orthogonal pulse sequences mapped into pseudo orthogonal matrix codes [5,6]. Optical delay lines are used to implement the matrix codes because the large data rate (>100 Mb/s) and number of users (8) result in short chip times (<1 ns). In this paper we discuss the hardware design options and component trade offs which led to our design concept. A CDMA network of four users, weight four has been breadboarded to validate and demonstrate the concepts (see Figure 2). The three basic characteristics of code autocorrelation, codecross correlation, and multiple user interference (MUI) have been measured. The measurements show that the embodiment performs according to theory, so that the design rules [3] established for optical CDMA can be readily extended to spaceborne photonics applications. One of the critical measures of network performance is MUI [7]. Figure 3 shows a computer simulation of the effects of MUI on signal and clutter statistics of our matrix code design. Clearly, as the network is fully utilized there is a potential degradation in the system's bit error rate (BER) due to the CDMA codes. For this reason we are exploring error correction schemes which reduce this BER degradation.

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(a), (b), (c), (d) are diagnostic points





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16. Abstract An OMAN breadboard for exploring advanced processing satellite circuit switch applications is introduced. Network architecture, hardware trade offs, and multiple user interference issues are presented. The breadboard test set up and experimental results are discussed.					
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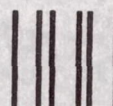
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